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(54) **MOLECULAR-JUNCTION-NANOWIRE-CROSSBAR-BASED NEURAL NETWORK**

(75) Inventor: **Greg Snider**, Mountain View, CA (US)

(73) Assignee: **Hewlett-Packard Development Company, L.P.**, Houston, TX (US)

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This patent is subject to a terminal disclaimer.

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See application file for complete search history.

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(57) **ABSTRACT**

A method for configuring nanoscale neural network circuits using molecular-junction-nanowire crossbars, and nanoscale neural networks produced by this method. Summing of weighted inputs within a neural-network node is implemented using variable-resistance resistors selectively configured at molecular-junction-nanowire-crossbar junctions. Thresholding functions for neural network nodes are implemented using pFET and nFET components selectively configured at molecular-junction-nanowire-crossbar junctions to provide an inverter. The output of one level of neural network nodes is directed, through selectively configured connections, to the resistor elements of a second level of neural network nodes via circuits created in the molecular-junction-nanowire crossbar. An arbitrary number of inputs, outputs, neural network node levels, nodes, weighting functions, and thresholding functions for any desired neural network are readily obtained by the methods of the present invention.

17 Claims, 17 Drawing Sheets